

U.S. ARMY BAYLOR UNIVERSITY GRADUATE PROGRAM  
IN HEALTH CARE ADMINISTRATION

COST EFFECTIVENESS OF IMPLEMENTING A SPORTS MEDICINE AND  
RECONDITIONING THERAPY CENTER AT THE SCHOOL OF INFANTRY,  
CAMP PENDLETON, CALIFORNIA

A GRADUATE MANAGEMENT PROJECT  
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13. ABSTRACT (Maximum 200 words) <p>The focus of this study is to determine the cost effectiveness of implementing a Sports Medicine and Reconditioning Therapy (SMART) Center with the School of Infantry (SOI) at Camp Pendleton, California and Naval Hospital, Camp Pendleton. This study will compare Fiscal Years(FY) 96 and 97 musculoskeletal injuries, medical attrition rates and return to duty percentages.</p> <p>This new venture is projected to show a decrease in attritions, medical injuries, and return to training rates. It is projected that in FY 97, medical attrition numbers will reduce by 110 personnel from FY 96. Medical injuries are projected in FY 97 to be 200 compared to 369 for FY 96.</p> <p>The SMART Center has brought health care delivery to the deckplates. As more research is conducted on this new method, the data compiled will provide pertinent information in rebdering medical care. This will give Navy Medicine a more positive image to the Line and United States Marine Corps communities. This will also show the war fighters that Navy Medicine is serious about operational readiness and supporting the Fleet</p>				
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## **CONDITIONS WHICH PROMPTED THE STUDY**

As the military continues to rightsize due to budget constraints, training personnel is a critical component of maintaining a combat ready force (Navy Strategic Plan 1996). Having a combat ready force requires maintaining physically fit personnel able to carry out the military's mission. Achieving this goal is a high priority for the Military Healthcare Service System (MHSS). Specifically, there is a push by the Navy's surgeon general to provide delivery of health care at the deckplates and have medical/dental personnel define measures of health and wellness instead of using traditional measurements of work such as patient visits, bed days, etc. The Navy needs to look at detection methods which will find a disease at an earlier stage (SG's SITREP 8-96). Medical personnel need to find innovative ways to deliver health care and define measures of health and wellness rather than measures of work.

Currently in the United States Marine Corps, Camp Pendleton is one of the two major combat training facilities on the West Coast. This base incorporates approximately 200 square miles of training area and support facilities. One of the areas a Marine is assigned to after "boot camp" is the Marine Corps School of Infantry (SOI) located in the northern section of the base in the 52 area. There are several courses offered at SOI which include: Marine Combat Training (MCT) for non-infantry Marines, Infantry Training for the Marines who are assigned an infantry or light armored vehicle (LAV) military occupational specialty (MOS), and the

Advanced Infantry Training for personnel who are assigned as leaders for an infantry squad or platoon with infantry units in the Fleet Marine Force (Carr 1996).

Marines with non-infantry MOS's are assigned to the Marine Combat Training Battalion. There are four squads within this battalion: Foxtrot, Golf, Hotel, and India. The mission of the MCT per Captain Carr, Academic Management Section, SOI, Camp Pendleton, California is "To train all non-infantry male Marines in weapons and infantry skills necessary to be well-rounded and highly disciplined combat Marines who can function as members of a rifle squad or machine gun team." The scope of this program of instruction is designed to train and instruct on weapons (M16A2, M249 Squad Automatic Weapon (SAW), M24UG Machine Gun (MG), M2.50 caliber MG, Mk19 MG), patrolling, basic individual and unit tactical measures, land navigation, communications, close combat, and physical fitness. The length of this program of instruction (POI) for non-infantry training is 24 days, excluding weekends. The Basic Infantry training was 23 days but changed to 17 days in January 1997. This change was implemented primarily to decrease the transition time between completion of training and the reporting time to the Fleet Marine Force. Approximately 80 percent of the training is conducted in the field with conditioning hikes of 6, 9, and 12 miles. During the 24-day program, three days are for gear issue or return, and 21 days are for training that includes 12 nights in the field. Student

workload for Fiscal Year (FY) 1995 was 13,381 with a projected estimate of 13,600 for FY 97. Due to the tremendous amount of students coming through, companies pickup almost every week. In FY 95, there were a total of 46 classes conducted. Optimally, the size of each class is between 250 to 300 students, but the range is from 150 to 500, depending on the number of students coming from the Marine Corps Recruit Depot (MCRD) in San Diego, California (Carr 1996).

Marines with infantry MOS's are assigned to the Infantry Training Battalion (ITB). There are five companies within this battalion: Alpha, Bravo, Charlie, Delta, and LAV2. The school's mission is "To train and provide a Military Occupational Skill (MOS) to qualified Marine infantrymen and LAV leaders to the Fleet Marine Force (FMF), Marine Security Forces (MSF) and Reserve Component." The scope is defined by the MOS training assigned to the student. The secondary mission, however, is the same as MCT, along with providing permanent personnel the opportunity to grow professionally. Other goals for this training include having these Non-Commission Officer's (NCO's) and Senior NCO's return to the FMF as better leaders with more MOS credibility. There are several POI's offered in this section: initially, a 20 day Basic Infantry course and then 23 days of MOS specific training. Some of the MOS training is Rifleman (MOS 0311), Machine Gunner (MOS 0331), Mortarman (MOS 0341), Anti-Tank Assaultman (MOS 0351), and Tube-launched,



optically-sighted, wire-guided (TOW) missile gunner (MOS 0352) and a 30-day POI for LAV Crewman (0313). There is a projected estimate of 4,300 students for FY 97. POI classes are held 16 times per year--except for the LAV Crewman classes which are held six times per year (Carr 1996).

Enlisted personnel who attend the Advanced Infantry Training are assigned to either the Infantry Squad Leader Course (ISLC) for corporals and Infantry Platoon Sergeant Course (IPSC) are both in Advanced Infantry Training (AIT) Company. LAV Leaders Course is in LAV Company, along with the LAV Crewman Course. The mission of this training is to make these individuals better leaders in their respective units. The length of POI for the ISLC is 60 days and classes are held four times a year. The length of POI for the ISPC is 75 days and classes are held three times a year. Almost all training for these two POI's is coordinated in the field. There is a projected estimate of 276 ISL students, 163 ISL students, and 60 LAV leaders for FY 97.

With a projected estimate of 18,390 students in FY 97, the various types of training and the mandatory hikes, there are going to be some musculoskeletal injuries. According to Colonel Bruce H. Jones, M.D., M.P.H., musculoskeletal injuries are a very large problem (Birk 1997). "Injuries are the leading problem in the military," Colonel Jones said. "Most preventable injuries occur because of overuse from

repetitive activities like running, road marching, digging trenches or loading a Howitzer over and over. In both combat and training, the number one cause of preventable injuries is vigorous physical training and operational activities." Previously, the student was sent to the 52 Area Branch Medical Clinic and, depending on the type of injury, possibly the hospital. With the Sports Medicine and Reconditioning Therapy Center, the musculoskeletal injury patients from the Rehabilitation Platoon can be evaluated right down the hall from their berthing space.

There is a Naval Hospital aboard Camp Pendleton that is staffed for 209 inpatient beds (NHCP 1996) and supports ten remote outpatient clinics. Four of the outpatient treatment facilities, known as area branch medical clinics (13, 21, 31, and 52), are operated by the Navy, or, the "Blue" side. These facilities serve active duty service members as well as family members and other eligible Department of Defense (DoD) beneficiaries. The other six outpatient area branch medical clinics (22, 33, 41, 43 53, and 62) are operated by the Marine Corps, or, the "Green" side, in direct support of Marine units. The Naval Hospital and area base medical clinics serve a total patient population of approximately 35,000 Marines in training and 29,000 family members on base, with approximately 200,000 beneficiaries within a 40-mile radius beyond the base (NHCP 1995).

The 52 Area Branch Medical Clinic is located approximately 20 miles from the Naval Hospital and supports the Marine Corps School of Infantry (SOI). The annual SOI student workload is approximately 20,000, with an annual workload of approximately 55,000 outpatient visits for the clinic. The clinic refers approximately 20,000 of these visits to the Naval Hospital's specialty care outpatient clinics (NHCP 1994). The average round-trip travel time between SOI and the Naval Hospital is about two hours. This long period of time is due to the minimal speed limits on base over rural roads by military bus (Craigiles 1995). For each SOI patient referral, a major portion of the training day is lost due to transportation arrangements and the clinic visit itself. In an effort to reduce this loss of manhours, a demonstration project was undertaken by the commanding officer of SOI and the commanding officer of the Naval Hospital. This project was called the Sports Medicine and Reconditioning Therapy (SMART) Center. The SMART Center is a non-surgical muscular skeletal complaints clinic which is offered as an alternative for patients to try conservative treatment options instead of, or while waiting for, an orthopedic consult (Seufert 1996). The Center is open five days a week from 0800 to 1500. The mission and scope of the SMART Center is to provide timely, comprehensive, muscular skeletal care to Marines of SOI in order to rapidly return them to training. SOI students receive walk-in appointments while referred patients from surrounding area branch

medical clinics are evaluated on a space available basis or on designated afternoons.

The process currently used to screen SOI students is that a Hospital Corpsman (HM) initially evaluates the student in the field or the Marine can request a visit to the center due to a muscular skeletal complaint. If the student is assigned to the Infantry Training Battalion (ITB), then an HM from the 52 Area Branch Medical Clinic goes to the field with the respective unit. If the student is assigned to the Marine Combat Training, the Battalion Aid Station (BAS) provides a designated HM to evaluate the student. If the condition is minor, the student will be returned to duty. If further evaluation is required, the student is referred to the SMART Center. A determination is then made on the patient's diagnosis, treatment and rehabilitation program, and whether or not he can continue to train or reassigned to the Student Administration Company (SAC), Rehabilitation Platoon. Then the student either returns back to training or checks in to the Rehabilitation Platoon. If the student goes to SAC, he receives a brief on the SMART Center hours of operation, medical capabilities, and appointment procedures. The SMART Center team and SAC Rehabilitation Platoon staff monitor student's progress. Member returns to full duty or is discharged from the USMC. Additionally, the Center serves as a muscular skeletal and sports therapy center for SOI and the northern Camp Pendleton areas and redefines the paradigms of how sports medicine and physical therapy is done. In this joint venture, SOI provided

\$43,752 in medical equipment and the working space for this center. The Naval Hospital provided the specialists in Sports Medicine, Podiatry, Physical Therapy, Chiropractic, as well as the technicians in each of these areas. Refer to Appendix 2 for further details. Additionally, the hospital or BUMED provided \$37,145 in medical equipment and Composite Health Care System (CHCS)/phone installation equipment. The Morale, Welfare and Recreation (MWR) department also contributed \$9,584 in redistribution of exercise equipment from on-base activities. With all the dollars invested in this project, the level of joint support, and the accessibility of medical services for the SOI students, the SMART Center should prove to be an outstanding rehabilitation facility.

### **STATEMENT OF THE PROBLEM**

Since this is a new concept in the delivery of healthcare to SOI students at Camp Pendleton, the cost effectiveness of this demonstration project has not been evaluated. On the surface, there appears to be significant cost savings from lost manhours in training costs and student attrition due to inability to successfully rehabilitate after a musculoskeletal injury. With readiness as the primary mission in the military today and continuous shrinking of human and financial resources, Navy

Medicine as well as the MHSS, needs to develop innovative ways of delivering healthcare to support this mission (Mayo 1996).

## **LITERATURE REVIEW**

The Marine Corps loses a tremendous percentage of its first-term Marines before they reach their normal end of active service (EAS). Due to this significant amount, this attrition rate is of great concern to the Commandant (Klauser 96). Specifically, a plan was developed within the last couple of years to monitor these non-EAS attrition rates at training sites such as SOI. When SOI students are injured in entry-level training, they are dropped from their training platoon. Historically, recruits at MCRD's are rehabilitated faster than at the SOI's due to better rehabilitation facilities and more permanent personnel assigned to this task. With the implementation of a SMART Center, the rate of return for training SOI students will be as good or better than the MCRD's.

Recognizing the need to improve the rehabilitation efforts at SOI, the Navy and Marine Corps decided on a joint venture not only to get the SOI student back to training faster, but also better (Painter 1996). In this article by Sergeant Painter, he quotes CDR Moore, the Sports Medicine Department Head, Naval Hospital, Camp Pendleton, who stated, "Healing the Marines quicker so they can continue training

means they will join the Fleet Marine Force sooner, which also translates into lower attrition rates." Sergeant Painter also quotes the Commanding Officer of SOI, Colonel Meagher: "Before the SMART Center was established, when a Marine was injured during training, he would spend up to six months on light-duty; that's when he lost hope. During this six-month period, most of the students lost were due to administrative reasons, not injuries." Navy Medicine's goal is to deliver health care services and provide the health care benefits in a cost-efficient way that meets our customers' needs. Now that the SMART Center is extremely accessible for the SOI students, there are no transportation logistics encountered, and the specialists are going to the customer which creates a win-win situation for Navy Medicine and the Marine Corps.

In similar studies conducted at Navy Recruit Training Centers (RTC) in San Diego, California and Great Lakes, Illinois, having some type of sports medicine center had a positive impact on student training. By establishing a sports medicine center at RTC San Diego, referrals to the Naval Hospital Orthopaedic Department decreased from between 20-30 to 3-5 per week (RTC San Diego 1992). In 1992, RTC Great Lakes developed a musculoskeletal team comprised of a general medical officer, physical therapist, physician assistant, independent duty corpsman, and physical therapy assistants. This team provided continuity of care, standard

rehabilitation protocols, and rigorous limited duty standards. The team evaluated recruits and was able to show a reduced attrition from injuries ( 21 percent in 1991 to 4 percent in 1992) and averaged fewer rehabilitation visits (16 per recruit in 1991 to 7 per recruit in 1992). Additionally, time spent by recruits in the rehabilitation unit was reduced by 50 percent (RTC Great Lakes 1992).

Collecting data on the type of medical injuries is vital to any process. In a study focused on acute ankle injuries conducted between September and October 1995 at nine Military Treatment Facilities (MTF's), it was found that 73 percent of the ankle injuries were sports-related, reflecting the risk of playing running-type sports (Lippert 1996). The finding by the team is not a surprise but does raise the question of whether prophylactic measures such as ankle supports, taping, minimum level conditioning, or more supervision would decrease this incidence. With establishment of the SMART Center, providers are being brought in during the first week of student orientation to inform the students of how they can prevent injuries, when to see medical personnel, and how much muscle soreness is expected during the training program. Additionally, the SMART Center team has developed an overprint of the Standard Form 600 to identify what day of training the student was injured, what training event the student was performing when he was injured, type of injury, and days of training missed. Refer to Appendix 1 for further details.



According to Dr. Garrett from the Division of Orthopaedic Surgery, Duke University Medical Center, Durham, North Carolina, there are a variety of non-contact or indirect injuries that can affect muscle function. Some examples include delayed onset muscle soreness, partial strain injury, and a complete rupture of the muscle. He states, "In delayed onset muscle soreness, eccentric loading, especially during unaccustomed exercise, results in microscopic damage to the contractile element of muscle centering on what appears to be random disruptions of the Z-lines. Reversible pain, weakness, and limited range of motion are the hallmarks of delayed onset muscle soreness. Pain usually peaks one to two days after exercise, and weakness and limited range of motion can persist over a week." Dr. Garrett concludes in his article that "findings from the laboratory indicate that certain muscles are susceptible to strain injury (muscles that cross multiple joints or have complex architecture). These muscles have a strain threshold for both passive and active injury. Strain injury is not the result of muscle contraction alone; rather, strains are the result of excessive stretch or stretch while the muscle is being activated. When the muscle tears, the damage is localized very near the muscle-tendon junction. After injury, the muscle is weaker and at risk for further injury.

Due to the nature of the type of conditioning a student may experience at SOI, exercise-induced muscle injury is a common problem in this environment and

accounts for substantial disability. The condition improves with time in most individuals, but chronic symptoms sometimes develop. Delayed soreness after unaccustomed exercise is also common since this training is equivalent to football practices twice a day. Numerous studies have demonstrated that muscle change and soreness is more frequent following exercise involving eccentric contractions (lengthening of activated muscles) than following exercise involving either isometric or concentric contractions (Mishra 1995). Previous studies of the human quadriceps muscles have shown that the nature of damage was experienced because of the eccentric contractions. Per Dr. Mirshra et al., "Specific ultrastructural abnormalities included disruption of the contractile apparatus and focal disorganization of the Z band (the boundary between sarcomeres). The sarcomeres are the segment of a myofibril between two adjacent Z lines, representing the functional unit of striated muscle. The results of subsequent studies involving a variety of animal models demonstrated fiber-type-specific damage and provided insight into the damage mechanism itself. Disruption of muscle fibers after eccentric exercise would be expected to provide a substantial inflammatory stimulus. However, since inflammation can itself cause damage in excess of that originally sustained by the tissue, prevention of inflammation might improve the status of the muscle after injury. On the basis of this assumption, non-steroidal anti-inflammatory drugs are commonly

prescribed to provide analgesia and to improve performance." The SMART Center team could conduct a similar research study and monitor how the medications they provide the SOI students affect their performance. There are numerous articles written on the structural and mechanical basis of exercise-induced muscle injuries. One article written by Dr. Friden and Dr. Lieber states that "strenuous exercises cause a disturbance of the muscle homeostasis. Homeostasis is the state of equilibrium (balance between opposing pressures) in the body with respect to various functions and to the chemical compositions of the fluids and tissues. Although muscle tissue is extremely plastic, destructive changes of muscle fine structure may occur in response to unusual demands." Since a majority of the SOI training is spent in the field, the probability of students experiencing exercise-induced injuries is extremely high.

The specialists involved with the SMART Center have a great understanding of the exercise-induced injuries and skeletal muscle injuries. Skeletal muscles are the primary organ system responsible for force generation and movement. Accordingly, by understanding the normal muscle movements, these specialists can accurately explain to a patient why one was injured. Per Doctors Lieber and Fowler, "When muscle or movement is lost due to disease, trauma, or disuse, an understanding of muscle properties can improve our ability to restore function."

From the American College of Sports Medicine, "Safe training methods are important in the prevention of all sport injuries (AAPA 1994). The training should be gradual and progressive; otherwise, the individual is at risk of obtaining an overuse injury." An overuse injury occurs from constant microtrauma to structures that do not have the strength required to withstand the forces of the activity. Attention to physical deficits, training methods, safety equipment, and psychological health should decrease the incidence of these injuries." Using this philosophy in an SOI training environment, the SMART team can be used to assist the staff with these kinds of problems. Bringing the SMART Center team in as a resource should have a positive impact on preventing musculoskeletal injuries, educating students, staff, and other patients on musculoskeletal injuries, and would also rehabilitate personnel in an expeditious manner.

#### **PURPOSE VARIABLES AND WORKING HYPOTHESES**

The focus of this study is to determine the cost effectiveness of implementing a SMART Center with the School of Infantry at Camp Pendleton, California and Naval Hospital, Camp Pendleton (NHCP). This study will compare FY 96 and FY 97 musculoskeletal injuries, medical attrition rates, and return to duty percentages. These injuries will only include SOI students who incur a musculoskeletal injury while

actually in training and are referred to the Student Administration Company. This study will not include personnel who report from Marine Corps Recruit Depot with an injury. Due to the length of training for non-infantry personnel versus training for infantry personnel, the variable cost will be calculated based on the expense associated for Basic Military, Marine Combat Training. Additionally, the calculations per student will be based on an entry-level Marine with less than one year of service. As Navy Medicine attempts to bring patient care to the deckplates and change the paradigms of how healthcare is delivered, will the SMART Center be the prototype for the future? More importantly, is Naval Hospital, Camp Pendleton supporting the United States Marine Corp's mission of readiness? The multi-disciplinary team working on this new approach to delivering care expects to demonstrate a decrease in the return-to-training time for Marine students in the Student Administration Company and the SOI attrition rates. Additionally, this will reduce the appointment and scheduling time for students and the burden of transportation and logistics to NHCP. The SMART Center will also screen active duty musculoskeletal injuries from some of the other outlying area base medical clinics (41, 43, 53, 62, 63 and 64) on designated afternoons, to reduce the same factors mentioned above for SOI students. Due to the rigorous training and required "humps" or hikes, it is imperative that these students be treated and rehabilitated as soon as possible once a

musculoskeletal injury occurs. Once a student is unable to tolerate or perform the physical requirements of training, then the student is dropped to the Student Administration Company.

The working hypotheses for this project are as follows:

H<sub>1</sub>: The SOI injury attrition rates will decline due to the implementation of the SMART Center.

H<sub>2</sub>: The return-to-training percentage for Marine students in the Student Administration Company will increase.

H<sub>3</sub>: It is cost effective to implement the SMART Center concept here at Camp Pendleton.

## **METHODS AND PROCEDURES**

To determine if the SMART Center concept will decrease attrition rates, a comparison will be made between FY 96 and FY 97 data maintained by the SAC rehabilitation platoon which is located at the 52 Area of Camp Pendleton. The first six months of FY 97 will be used, and a weighted average calculated from these first six months will be used for the remainder of the fiscal year. The Lotus database maintained by SAC is used strictly to monitor the number of Marines lost from SOI and for what reason. One assumption is that none of the medical equipment currently used has to be replaced in FY 97. Additionally, provider and technician wages are considered sunk costs.

By comparing these two fiscal years, the number of personnel being returned to SOI for training can be tracked to see what impact the SMART Center is having on reconditioning musculoskeletal injuries. The cost effectiveness of this project will be based on initial cost of the SMART Center which started August 1, 1996 compared to the number of SOI students in FY 97 who were rehabilitated and returned to training instead of being discharged from the USMC. This variable cost per student will be taken from the Marine Corps Cost Factors Manual, Marine Corps Order P7000.14 (Gese 1997). This reference lists the direct and indirect costs associated with training each student. Due to the length of training for non-infantry personnel versus training for infantry personnel, the variable cost will be based on Basic Infantry Military, Marine Combat entry-level training. The 1997 variable cost for this category per student is \$ 22,879, which includes a 2 percent inflation factor. This amount and category of student was used since it represents the lowest cost for people completing training. Of course, each additional level of training increases the cost of producing a qualified Marine. This will focus only on the SOI students assigned to rehabilitation platoon and not the other active duty patients being treated from the outlying clinics. This study will not calculate the transportation cost avoidance per student since the Center installed telemedicine capability as of January 1997. Additionally, due to the various ranks among the students attending this

training (Private to Lance Corporal or E-1 to E-3), the calculations will be based on an entry-level Marine with less than one year of service.

The validity and reliability of this report depends on the SAC rehabilitation platoon personnel who maintain the database. The database is maintained by a staff sergeant who has assistance from computer proficient personnel within the platoon. These individuals are under the guidance of the staff sergeant and the information is verified by the commanding and executive officers before dissemination. The reliability is within 95 percent since only certain people have access to this information. If anyone would request the workload for a fiscal year, one would receive the same numbers as previous reports. The validity may be questionable if these designated individuals allow any other personnel access to this database. To date, there have been no computer errors noted even though the computer system crashed twice. Additionally, the SAC rehabilitation platoon forwards this report on a monthly basis to the SOI commanding officer. The report is reviewed at the company and battalion level for accuracy.

## **RESULTS OF THE STUDY**

Several site visits were made to the SMART Center and Student Administration Company to ensure no major changes had occurred and to gain a



better understanding of the process involved with treating SOI students.

Additionally, the database source was checked to ensure the information was still reliable and valid. After data was compiled for the first six months of FY 97 by SAC, a comparison was made against FY 96. Since the SMART Center did not become operational until August 1, 1996, there was no influx of patients for August and September since the marketing efforts had not taken full effect.

The first hypothesis was that the SOI medical attrition rates would decrease. The medical attrition number in FY 96 was 160 compared to a projection of 50 for FY 97. This represents a 220 percent decrease. Refer to Table 1. Students may be set back in their training due to rehabilitation but they are able to receive the medical treatment to resolve their musculoskeletal injuries--unless surgery is required. Even then, some of the students received the surgery and were able to be rehabilitated and returned back to training. Accordingly, I could not reject the null hypothesis. See Appendix 3 for further details.

Table 1. SOI Medical Attrition Numbers for FY 96 & projected for FY 97

Medical Reconditioning Injuries	
FY 96	160
Projected for FY 97	50

As evidenced in Table 2 and Appendix 4, the total medical injuries decreased from 369 in FY 96 to 200--which is projected for FY 97. This represents a 54 percent decrease in medical injuries. This was accomplished by a combination of preventive lectures to students prior to the commencement of training, a collaborative effort between the SMART Center personnel and SOI staff, and a proactive effort on when students should be sent to medical so that injuries could be taken care of before the student was completely unfit for duty in the USMC. Additionally, the SMART Center has the medical equipment on hand to treat routine musculoskeletal injuries which, in the past, might have gone untreated since the student had to go 17 miles to the hospital and lose all those hours of training. Now the students have easy access to the specialist and medical equipment which has resulted in a more efficient rehabilitation environment. This delivery of healthcare has received numerous positive responses from the Marine customers.

The second hypothesis was that the return to training percentage would increase. In FY 96, there were 91 students returned to the ITB, 61 returned to the MCT, and 57 returned to the FMF or another MOS-producing school. Due to medical conditions, there were 160 students discharged from the USMC. This resulted in a 56.64 return to duty percentage. Refer to Table 3 and Appendix 7 for further details. In FY 97, it is projected that 70 students will be returned to the ITB,

56 to the MCT, and 24 to the FMF or another MOS-producing school. This projects a 75 percent return to duty. Comparing the two fiscal years, it is projected that the SMART Center and SOI venture will increase the return to duty percentage by 18.4 percent. Refer to Table 2 and Appendix 8 for further details. Carefully analyzing this information, I could not reject the null hypothesis. See Appendix 5 for additional information.

Table 2. SOI Return to Training Percentage for FY 96 & Projected for FY 97

<b>Return to Training</b>	
FY 96	56.64%
Projected for FY 97	75.00%

The third hypothesis was that it was cost effective to implement the SMART Center concept here at Camp Pendleton. The USMC spends a lot of money sending a student through boot camp and then through SOI. A variable cost of approximately \$ 22,879 per student (Gese 1997) has been used in the calculation to determine the cost effectiveness of this project. This amount is taken from the variable cost of \$ 16,449 for Basic Military Training, Recruit Training and \$ 6,430 for a student completing Marine Combat Training. This is an extremely conservative estimate since some of the POI's have a higher variable cost due to the length of training. The

variable cost amount used is the very basic cost for a student completing the basic infantry training phase. Initially, the total start up cost was \$ 90,481 for this project. It is projected that, in FY 97, approximately 150 students will receive medical treatment through the SMART Center and return to training. This effort projects a substantial savings for the USMC. The savings projected for FY 97 is over \$3 million which indicates an extremely high rate of return on the initial investment. Refer to Tables 3 and 4 for more details. This does not factor in the SOI instructors, outlying clinic patients, and manhours saved by having this Center in the northern section of the base. Refer to Appendix 6 for further details.

Table 3. Projected SOI Cost Savings for FY 97

Fiscal Year	Expenditures
FY 96 Initial Costs	\$ 90,481
Projected Savings for FY 97	\$ 3,431,850
<b>Gross Savings</b>	<b>\$ 3,341,369</b>

Table 4. Calculation for FY 97 Projected Savings

Number of students x Variable costs = Projected Cost Savings
--

## **Discussion**

Currently, the SMART Center has to rely on SAC personnel to provide accurate data regarding personnel assigned to the rehabilitation platoon. The SMART Center could work with the Medical Expense and Performance Reporting System (MEPRS) personnel to obtain a code so this information could be obtained from the Composite Health Care System (CHCS). This data could be used for research by the SMART Team to calculate costs, identify how many SOI student visits actually occur each month, and determine staffing levels. The provider would also have to ensure that he/she was using the SMART Center MEPRS code and not the hospital's, to prevent workload data being shifted from one location to the other. A safeguard to ensure this reporting discrepancy does not occur could be handled by the Smart Center's CHCS coordinator at the end of each workday.

The SMART Center could also use this new way of delivering health care to evaluate how much money is saved on ancillary services since the patient is screened by a specialist, research on strength conditioning or evaluate how certain anti-inflammatory medications affect patient recovery, and how wellness promotion lectures benefit the patients. Any of these potential areas could not only help deliver quality medical care but could impact the way military medicine is practiced. Training personnel while keeping them healthy will always be a challenge. By maintaining

accurate patient visits and records, using correct MEPRS codes, and analyzing this information, the SMART Center multi-disciplinary team has an opportunity to enhance health care delivery and operational readiness. Additionally, the SMART Center team could enhance the training level of the HM's in the field by providing weekly or bi-monthly professional development educational classes. This is extremely important since the ITB companies receive their medical support from the 52 Area Branch Medical clinic. The company may or may not have the same HM as the week before for various reasons. Depending on the training level of the HM, this could lead to serious medical injuries if the initial injury is not treated properly. The HM for MCT is designated from the Battalion Aid Station which provides the medical support. The same HM goes with the various units of the battalion when they go to the field. Additional training of these field HM's by the SMART Center team could contribute significantly to improved customer satisfaction from the SOI student and staff perspective and increase the time of recovery from medical injuries.

## **CONCLUSION**

With this new way of treating SOI students, a decrease in attrition, medical injuries, and return-to-training rates has occurred. It is projected that in FY 97 medical attrition numbers will be reduced by 110 personnel from FY 96. Medical injuries in FY 97 are projected to be 200 compared to 369 for FY 96. Additionally, this new delivery system is projected to be cost efficient and show a significant savings to the USMC while being extremely customer-focused. The \$3 million savings represents a highly successful collaboration project between the USMC and Navy Medicine. This system should also reduce the backlog of appointments in the Orthopedic Clinic since other outlying clinics in the northern portion are sending personnel to the SMART Center on a daily basis to be evaluated instead of to the hospital. Since readiness is a primary factor in today's military, this multi-disciplinary approach could be implemented at other Marine bases which the Navy supports or other similar training activities in the other services.

The United States Marine Corps and the Naval Hospital, Camp Pendleton have taken a very proactive approach in treating the SOI students. This joint venture has increased the quality of care and access while reducing costs. This has been done by bringing a multi-disciplinary team closer to the customer which is projected to reduce the number of students being discharged for medical reasons, and is projected

to increase the return to duty percentage. The SMART Center venture has brought healthcare delivery to the deckplates. As more research is conducted on this new method, the data compiled will provide pertinent information in rendering medical care. This will give Navy Medicine a more positive image to the Line and United States Marine Corps communities. This will also show the war fighters that Navy Medicine is serious about operational readiness and supporting the Fleet.

Another factor which reflects Naval Hospital, Camp Pendleton's commitment to enhance readiness and serve our customers is the installation of telemedicine at the SMART Center. Not only does this allow providers to discuss a medical condition pertaining to an SOI student, but it will also give them an opportunity to discuss some of the other patients from the outlying clinics. This will assist Navy Medicine prepare for the 21st century by maximizing resources and receiving a high rate of return from invested assets. Modeling this process could significantly improve the delivery of health care in MHSS, operational readiness, and the perception of military medicine. As the military's human and financial resources continue to decline, this system could provide invaluable information in clinical pathways, inservice training, and future lost manhours to the USMC. Having this multi-disciplinary team work closely with the SAC rehabilitation platoon has proven to be a tremendous benefit to the USMC and Navy Medicine.

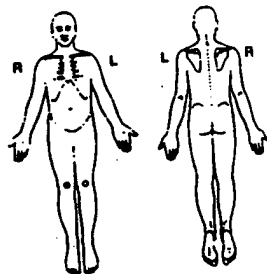
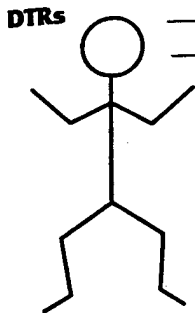


**S. M. A. R. T. CENTER**  
**Sports Medicine and Reconditioning Therapy**  
**INJURY REPORT**  
**SF-600**

**NAME:** \_\_\_\_\_ **Date:** \_\_\_\_\_  
**SSN:** \_\_\_\_\_ **Rank:** \_\_\_\_\_ **Allergies:** \_\_\_\_\_  
**Company:** \_\_\_\_\_  
**Day of Trng:** \_\_\_\_\_ **Date of Injury:** \_\_\_\_\_

**Nature of Injury:** \_\_\_\_\_ Acute \_\_\_\_\_ Chronic \_\_\_\_\_ Recurrent \_\_\_\_\_ Follow-up/Referral

**Occasion:** \_\_\_\_\_ Hike 3/6/9/15/20 \_\_\_\_\_ Calisthenics  
 \_\_\_\_\_ March/Run/Movement \_\_\_\_\_ Weapons training/Line Training  
 \_\_\_\_\_ Crucible \_\_\_\_\_ Weight training  
 \_\_\_\_\_ Lifting \_\_\_\_\_ Recreational/Sports related  
 \_\_\_\_\_ Sit-ups/Pull-ups \_\_\_\_\_ Accident/MVA/Fall  
 \_\_\_\_\_ MOS Training \_\_\_\_\_ S/P Surgery  
 \_\_\_\_\_ Other \_\_\_\_\_



**Training Missed**

Days: \_\_\_\_\_ 0 \_\_\_\_\_ 1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6  
 Weeks: \_\_\_\_\_ 1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4  
 Months: \_\_\_\_\_ 1 \_\_\_\_\_ 2 \_\_\_\_\_ 3

**History:** \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Rxment to date:** \_\_\_\_\_ **Better/Worst/Same**

**Physical findings: Insp** \_\_\_\_\_  
 \_\_\_\_\_

**Palp** \_\_\_\_\_

**ROM** \_\_\_\_\_

**Flexibility** \_\_\_\_\_

**Motor/Strength** \_\_\_\_\_

**Sensory** \_\_\_\_\_

**Special tests** \_\_\_\_\_  
 \_\_\_\_\_

**XRAYs:** \_\_\_\_\_

**LABS:** \_\_\_\_\_

**DIAGNOSIS:** \_\_\_\_\_

<u>          </u> Cast (WB/NWB)	<u>          </u> Splint (Support/UG/TS)
<u>          </u> Aircast/Brace/Ace Wrap	<u>          </u> Knee sleeve/patella buttress
<u>          </u> Crutches	<u>          </u> Hinge Knee/ROM
<u>          </u> Cast (SAC/LAC/TS)	<u>          </u> FWB/PWB/TDWB

**REFERRAL:** \_\_\_\_\_ Chiropractic \_\_\_\_\_ MRI/CT Scan  
 \_\_\_\_\_ Podiatry \_\_\_\_\_ Bone scan  
 \_\_\_\_\_ Orthopedics \_\_\_\_\_ Neurology  
 \_\_\_\_\_ Balboa (NMCSO) \_\_\_\_\_ Telemedicine  
 \_\_\_\_\_ Knee/Back School \_\_\_\_\_ Other

**DISPOSITION:** \_\_\_\_\_ Light Duty x \_\_\_\_\_ days  
 \_\_\_\_\_ Fit for Full Duty  
 \_\_\_\_\_ Continue/Drop to SAC  
 \_\_\_\_\_ No Duty x \_\_\_\_\_ days  
 \_\_\_\_\_ Limited Duty x \_\_\_\_\_ mos  
 \_\_\_\_\_ Recommend Admin Sep

**PLAN:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**GOALS:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

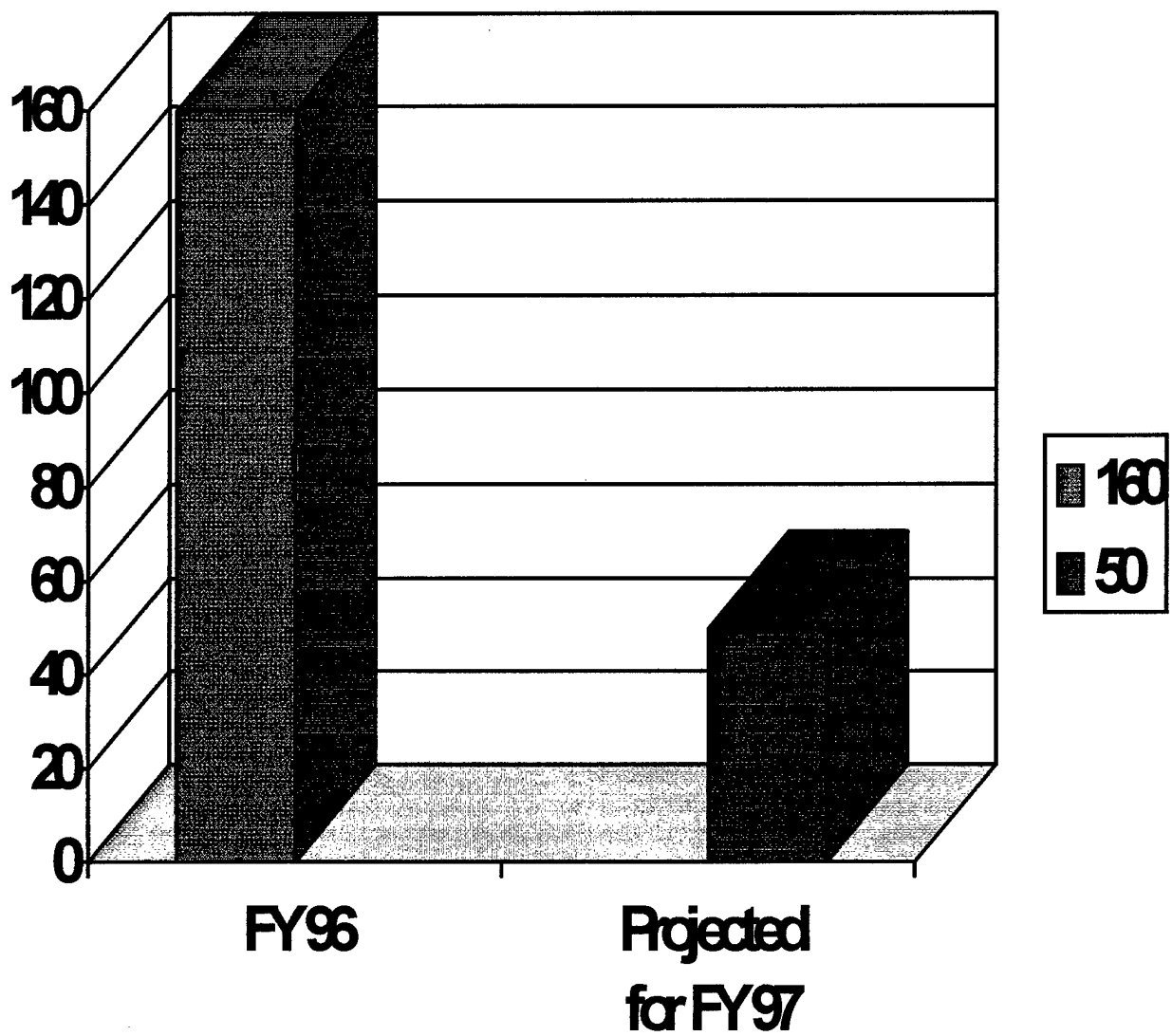
**Patient has been instructed in and understands exercise program**

**SIGNATURE:** \_\_\_\_\_

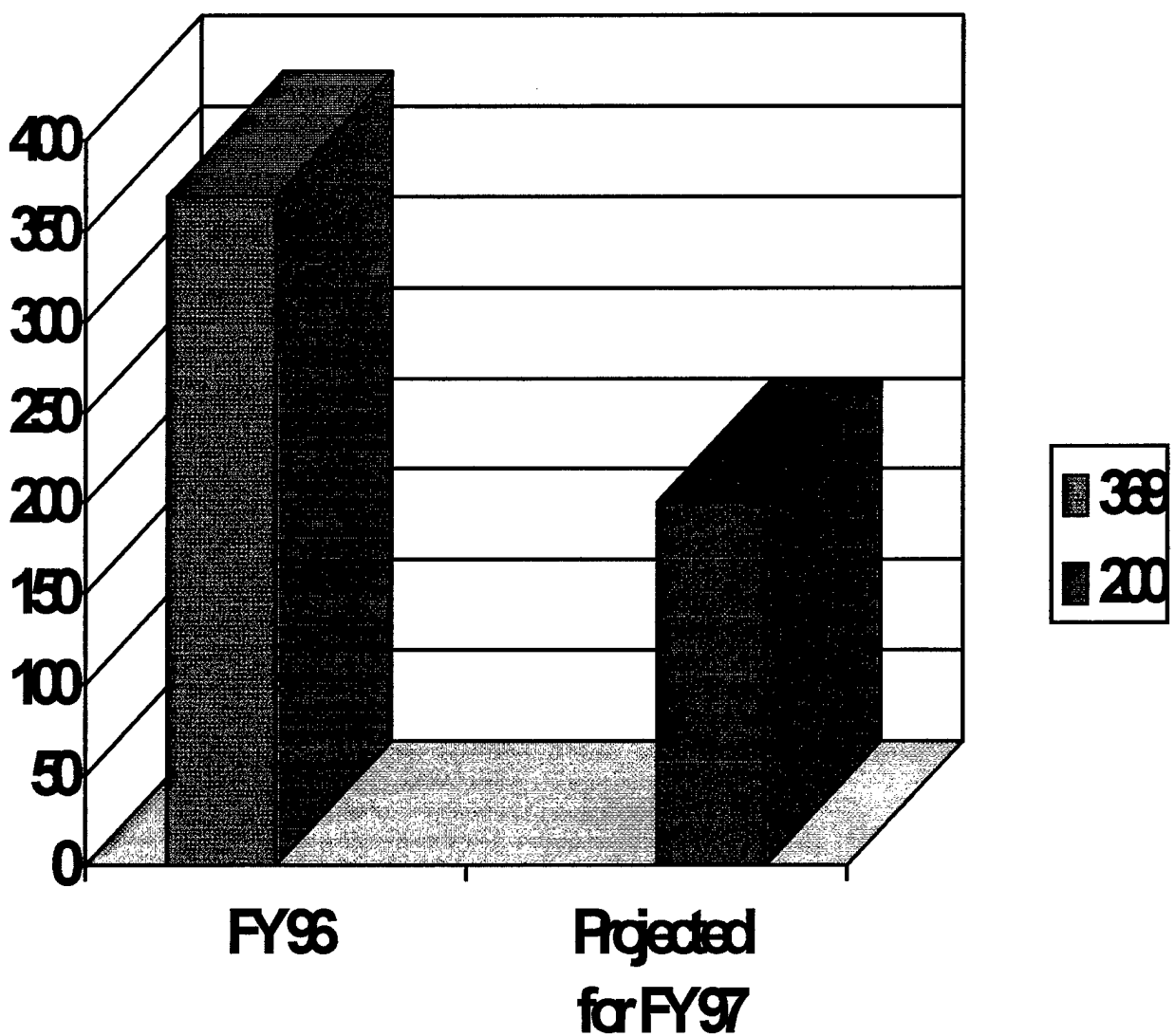
**APPENDIX 2: SPORTS MEDICINE AND RECONDITIONING THERAPY CENTER  
STAFF**

<u>Rank/Name</u>	<u>Specialty</u>	<u>Work days</u>
CDR Moore	Sports Medicine	Tuesday only
LCDR Seufert	Sports Medicine	Monday, Wednesday, Thursday
LCDR Louk	Podiatry	Monday, Thursday ( <b>Started Nov 96</b> )
LT Humphries	Physical Therapist	Tuesday, Wednesday
LT Bell	Podiatrist	Monday, Thursday ( <b>Until Nov 96</b> )
LTjg Gilford	Physician Assistant	Monday, Tuesday, Friday
LT Kauffman	Dietician	Wednesday only
Doreen Gagnon	Health Promotion	<b>(Rotates with LT Kauffman)</b>
Scott Gilford	Chiropractic	Tuesday & Thursday PM only
Jeff Schneider	Chiropractic	<b>(Rotates with Dr. Gilford)</b>
HM2 Macon	Ortho Tech	Monday-Friday
HM3 Culver	PT Tech	Monday-Friday (Until Oct 96)
HM3 Lawson	FMF	Monday-Friday
HM3 Hilburn	PT Tech	Monday-Friday (Replaced HM3 Culver)
HN Ilagon	FMF	Monday-Friday
HN Galey	FMF	Monday- Friday (Started Jan 97)

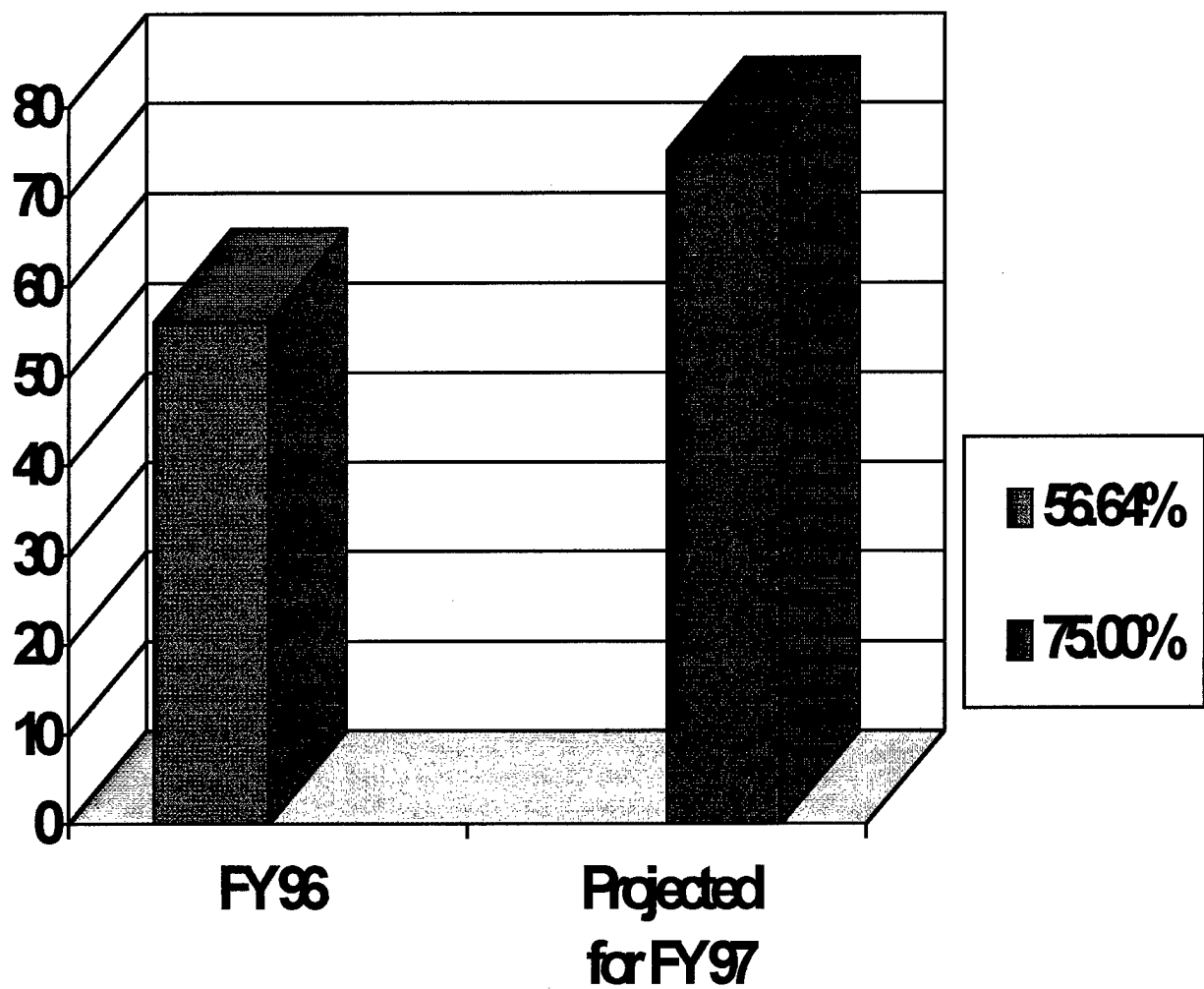
# Medical Attrition Numbers



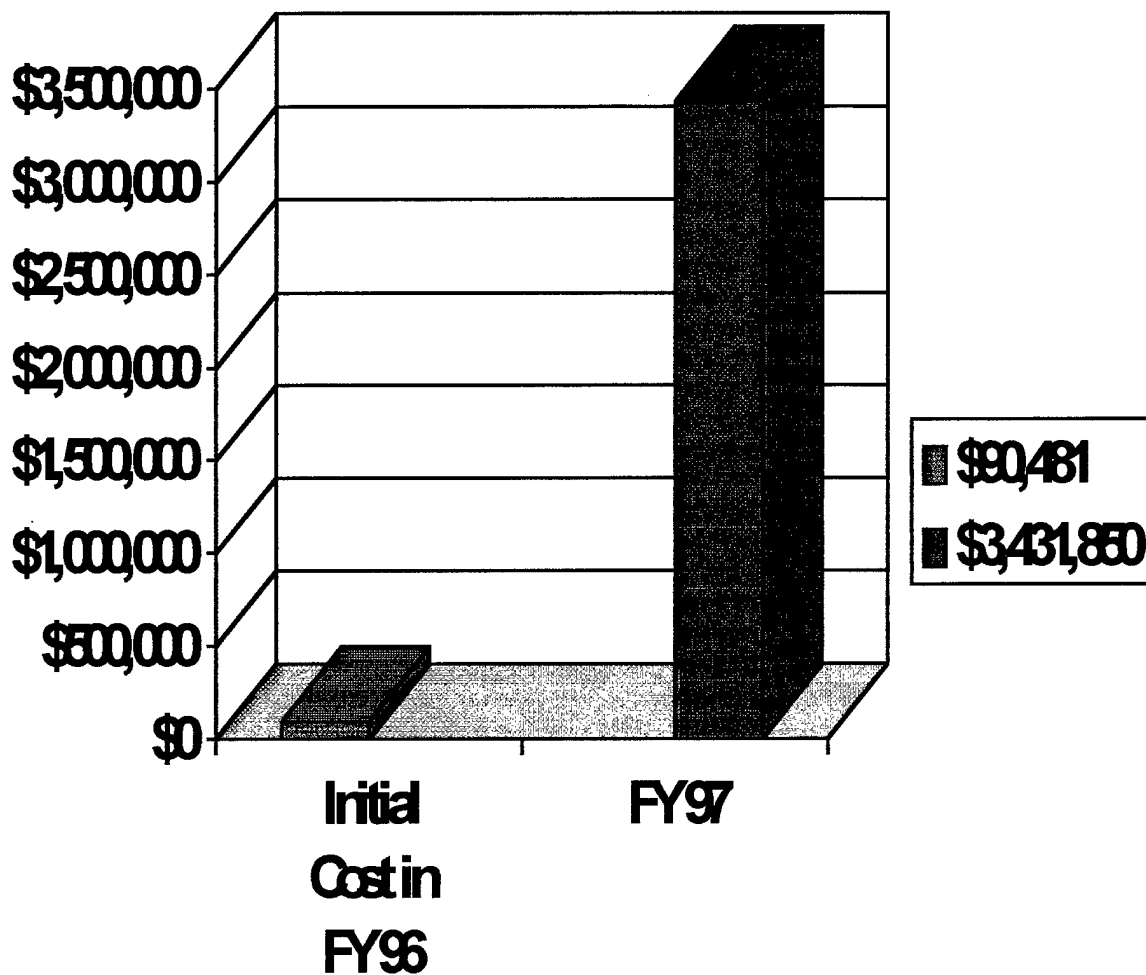
# Medical Rehabilitative Injuries



# Return to Training



# Projected Cost Savings for FY 97



**Student Administration Company, Rehabilitation Platoon  
School of Infantry, Camp Pendleton, California  
Rehabilitation Report for Fiscal Year 1996**

<u>Students Rehabilitated and returned to:</u>	<u>Total:</u>	<u>Percentage:</u>
A CO., ITB	19	5.15%
B CO., ITB	28	7.59%
C CO., ITB	17	4.61%
D CO., ITB	21	5.69%
<u>LAV CO., ITB</u>	<u>6</u>	<u>1.63%</u>
<b>Infantry Training Battalion subtotal:</b>	<b>91</b>	<b>24.67%</b>
F CO., MCT	21	5.69%
G CO., MCT	17	4.61%
H CO., MCT	9	2.44%
<u>I CO., MCT</u>	<u>14</u>	<u>3.79%</u>
<b>Marine Combat Training subtotal:</b>	<b>61</b>	<b>16.53%</b>
Fleet Marine Force (FMF)	44	11.92%
<u>Military Occupational Skill (MOS)</u>	<u>13</u>	<u>3.52%</u>
<b>Graduate subtotal:</b>	<b>57</b>	<b>15.44%</b>
<b>Returned to Duty Total:</b>	<b>209</b>	

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**Students Lost from Training and Discharged**

Medical Platoon	160	43.36 %
<b>Students dropped subtotal:</b>	<b>160</b>	<b>43.36%</b>

**Grand Total: 369**

**Students Rehabilitated and returned to duty: 56.64%**

(Returned to duty total/Total Medical Injuries)

**Note:** The amount calculated per student is based on an E-1's pay with less than one year of service.



APPENDIX 8: REHABILITATION REPORT FOR FISCAL YEAR 1997

**Student Administration Company, Rehabilitation Platoon  
School of Infantry, Camp Pendleton, California  
Rehabilitation Projected Report for Fiscal Year 1997**

<u>Students Rehabilitated and returned to:</u>	<u>Total:</u>	<u>Percentage:</u>
A CO., ITB	28	14.00%
B CO., ITB	24	12.00%
C CO., ITB	10	5.00%
D CO., ITB	8	4.00%
<u>LAV CO., ITB</u>	<u>0</u>	<u>0.00%</u>
<b>Infantry Training Battalion subtotal:</b>	<b>70</b>	<b>35.00%</b>
F CO., MCT	22	11.00%
G CO., MCT	2	1.00%
H CO., MCT	12	6.00%
<u>I CO., MCT</u>	<u>20</u>	<u>10.00%</u>
<b>Marine Combat Training subtotal:</b>	<b>56</b>	<b>28.00%</b>
Fleet Marine Force (FMF)	16	8.00%
<u>Military Occupational Skill (MOS)</u>	<u>8</u>	<u>4.00%</u>
<b>Graduate subtotal:</b>	<b>24</b>	<b>12.00%</b>
<b>Returned to Duty Total:</b>	<b>150</b>	

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**Students Lost from Training and Discharged**

Medical Platoon	50	25.00%
<b>Students dropped subtotal:</b>	<b>50</b>	<b>25.00%</b>

**Grand Total: 200**

**Students Rehabilitated and returned to duty: 75.00%**  
(Returned to duty total/Total Medical Injuries)

**Note:** A weighted average was used for April-September based on the first six months of the FY.  
The amount calculated per student is based on an E-1's pay with less than one year of service.

## WORK CITED

- Birk, Marcie 1996. Injury Prevention in the Military, An interview with COL Bruce H. Jones. Army Health Connection, Winter 1997, 1,2, 4.
- Carr, C. U.Captain, USMC . 1996. Interview by the author with Officer in Charge, Academic Management Section, Marine Corps Base Camp Pendleton School of Infantry. Marine Corps Base Camp Pendleton, September 20.
- Friden, Jan, M.D. 1992. Structural and mechanical basis of exercise-induced muscle injury. The American College of Sports Medicine 24, no 5(December 1991):521-530.
- Garrett, William E., Jr.1996. Muscle Strain Injuries. The American Journal of Sports Medicine 24, no 6 (S-2 - S-8) 9 April 1996.
- Gese, T. C. 1997. Interview by author with the Assistant Comptroller, Marine Corps Recruit Depot. San Diego, California, 26 March.
- Klauser, R. LtCol, USMC 1996. Non-Eas Attrition of Marine Students from Formal Training. CGMCCDC Quantico VA//TE/C463FT/, Message 161631Z Jul. Three pages.
- Lippert, Fredrick G. 1995. Acute Ankle Injuries Special Study. Civilian External Peer Review Program, December, 1-6.
- Mayo, S. B., RRA 1996. Navy Medical Department's Strategic Planning Process. Navy Medicine, Vol 87, no 4, July-August, 10-15.
- Medical Expense and Performance Reporting System Annual Report 1994. Naval Hospital, Camp Pendleton.
- Mishra, Dev V., M.D. 1995. Anti-Inflammatory Medication after Muscle Injury. The Journal of Bone and Joint Surgery. Vol 77-A, no 10(October 1995):1510-1519.
- Musculoskeletal Morbidity Data 1993. Recruit Training Center. Great Lakes, Illinois.
- Musculoskeletal Morbidity Data 1993. Recruit Training Center. San Diego, California.
- Painter, D. L., SGT 1996. SOI Opens New Sports Medicine Center. Scout Newspaper, 6 August, 1.

Retrospective Analysis Planning System 1995. Workload Data, Naval Hospital Camp Pendleton.  
Craigmiles, Raymond G. 1995. Telemedicine Strategic Planning and Implementation  
Issues in the Navy Medical Department, 7 June.

Seufert, Kevin T. LCDR, MC, USNR 1996. Interview by author with Head, Sports Medicine and  
Rehabilitative Therapy Center, Marine Corps Base Camp Pendleton. Marine Corps Base  
Camp Pendleton, California, 28 August.

The Prevention of Sport Injuries of Children and Adolescents 1994. American College of Sports  
Medicine 25, no 8:437-442.

Whiteman, Jamison CDR, MSC, USN 1996. Naval Hospital, Camp Pendleton Business Plan, 3  
July.